Industriefunkuhren

hopf Elektronik GmbH

Technical Manual

GPS Sync Module

Model 8024GPS

ENGLISH

Version: 01.01 – 26.04.2016

Valid for Devices 8024GPS with FIRMWARE Version: **01.xx**
and from *hmc* software Version: **01.12**

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Version number (Firmware / Manual)

THE FIRST TWO DIGITS OF THE VERSION NUMBER OF THE TECHNICAL MANUAL AND THE FIRST TWO DIGITS OF THE FIRMWARE VERSION MUST **COMPLY WITH EACH OTHER**. THEY INDICATE THE FUNCTIONAL CORRELATION BETWEEN DEVICE AND TECHNICAL MANUAL.

THE DIGITS AFTER THE POINT IN THE VERSION NUMBER INDICATE CORRECTIONS IN THE FIRMWARE / MANUAL THAT ARE OF NO SIGNIFICANCE FOR THE FUNCTION.

Downloading Technical Manuals

All current manuals of our products are available free of charge via our homepage on the Internet.

Homepage: http://www.hopf.com

E-mail: info@hopf.com

Symbols and Characters

Operational Reliability

Disregard may cause damages to persons or material.

Functionality

Disregard may impact function of system/device.

Information

Notes and Information.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Safety regulations

The safety regulations and observance of the technical data serve to ensure trouble-free operation of the device and protection of persons and material. It is therefore of utmost importance to observe and compliance with these regulations.

If these are not complied with, then no claims may be made under the terms of the warranty. No liability will be assumed for any ensuing damage.

Safety of the device

This device has been manufactured in accordance with the latest technological standards and approved safety regulations

The device should only be put into operation by trained and qualified staff. Care must be taken that all cable connections are laid and fixed in position correctly. The device should only be operated with the voltage supply indicated on the identification label.

The device should only be operated by qualified staff or employees who have received specific instruction.

If a device must be opened for repair, this should only be carried out by employees with appropriate qualifications or by ***hopf*** Elektronik GmbH.

Before a device is opened or a fuse is changed all power supplies must be disconnected.

If there are reasons to believe that the operational safety can no longer be guaranteed the device must be taken out of service and labelled accordingly.

The safety may be impaired when the device does not operate properly or if it is obviously damaged.

CE-Conformity

This device fulfils the requirements of the EU directive 2014/30/EU "Electromagnetic Compatibility" and 2014/35/EU "Low Voltage Equipment".

Therefore the device bears the CE identification marking
(CE = Communautés Européennes = European communities)

The CE indicates to the controlling bodies that the product complies with the requirements of the EU directive - especially with regard to protection of health and safety for the operator and the user - and may be released for sale within the common markets.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Contents Page

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

1 General

The ***hopf*** Sync Module 8024GPS is a GPS Module for the reception and evaluation of GPS signals for high-precision signal generation and output of time information. In combination with other hardware output modules, rack vesions and power supplies the module can be "custom-tailored" set-up and used for various applications. The configuration of the GPS settings and the signal generation is made via the serial remote interface.

Some of the Sync Modules 8024GPS basic functions:

- Simple configuration using ***hmc*** software **on remote interface**
- Remote interface (Serial-Remote) on the front panel (RS232 format)
- **Status LEDs** on the front panel
- **Status optical coupler** on the front panel
- **High freewheel accuracy** through GPS-supported regulation of the internal quartz base
- Completely **maintenance-free** system
- **SyncOFF timer** (reception failure bypassing) for operation free of fault messages - even in difficult reception conditions
- Redundant **multiple validation of the synchronization signal** for fault-free and leap-free signal evaluation
- Maintenance-free, buffered **back-up clock** for more than three days

Accessories supplied:

- Serial programming cable KA6870 (2m, 9-pole socket to 9-pole socket) to connect to a PC.

As the Module 8024GPS is supplied in system build-ups, the build-up of the unit and the system-specific connections and signal outputs are documented in the accompanying manual.

Not all signal outputs parameterizable via the ***hmc*** software are always available as physical outputs for the different system variants.

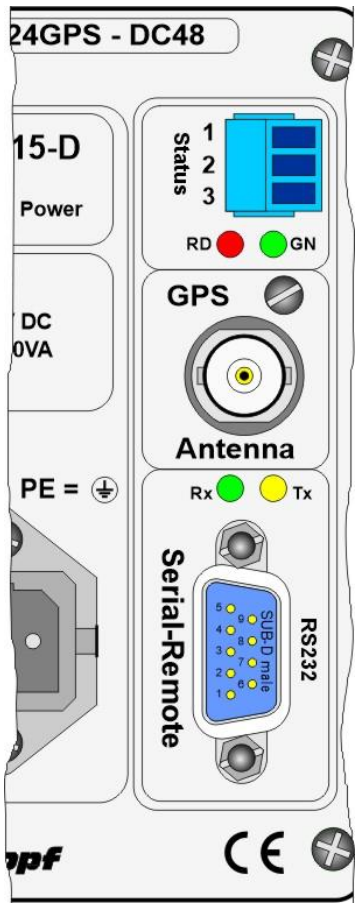
The available functions and their appropriate physical outputs are stated in device-specific manual.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

2 Hardware

This chapter describes the connections and LED elements of the Sync Module 8024GPS.

2.1 Example: Front Panel for DIN Rail Mounting



Status (LEDs + Optical Coupler)	
3-pole Connector	
Pin	**Signal**
1	Collector (+)
2	n.c.
3	Emitter (-)
LED	**Meaning**
RD	Status LED red
GN	Status LED green

GPS Antenna	
BNC connector	
GPS	Antenna Input

Serial-Remote	
LED	**Meaning**
Rx	LED green - reception of serial data
Tx	Led yellow - transmission of serial data
9-pole SUB-D connector	
Pin	**Signal**
1	n.c.
2	RS232c (V.24) RXD
3	RS232c (V.24) TXD
4	n.c.
5	GND
6	n.c.
7	n.c.
8	n.c.
9	n.c.

n.c. = not connected

2.2 Front Panel Connections

2.2.1 GPS Antenna Connection

The coaxial cable of the GPS antenna equipment is connected to the BNC socket marked **"GPS Antenna"** on the front panel. Further specifications concerning the installation of the antenna equipment, such as cable lengths and cable types, can be found in the document titled "GPS Antenna Equipment".

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

2.2.2 Status LEDs

The status LEDs on the front panel signal the module's current (synchronization) status. The meanings of the LEDs are as follows:

LED RD - Red	LED GN - Green	Status	STATUS Code
Off	ON	**Sync** (radio-synchronous) with quartz regulation	**SYNC**
Off	Flashes	**Sync** (radio-synchronous) - SyncOFF timer running	**SYOF**
Flashes	ON	**Sync** (radio-synchronous) - simulation mode	**SYSI**
Flashes	Flashes	**Quarz** - SyncON timer running	**QUON**
ON	ON	**Quarz** - time was set via synchronization source	**QUEX**
ON	Flashes	**Quarz** - time set manually or after reset	**QUSE**
ON	**Off**	**No valid time**	**INVA**
Off	**Off**	No operating voltage / faulty	---
3Hz	**Off**	**General Module Error (PCID)**	**INVA**
3Hz	**Invert 3Hz**	**User settings missing (Difference time / ST-WT Changeover)**	**INVA**

2.2.3 Status Optical Coupler

The status optical coupler provides a potential isolated switching contact for monitoring the modules synchronization status.

Function:

Status output via 3-pole terminal with selection of the desired synchronisation status at which reporting is to be activated:

Optical coupler:

- Selected status or better achieved – Optical coupler switched through
- Selected status not achieved – Optical coupler blocked

The desired reporting status is set via the ***hmc*** software.

2.2.4 Serial-Remote Interface for ***hmc*** software

The connection to a PC's RS232 serial interface is made by means of the KA6870 interface cable supplied.

The Serial-Remote interface for the configuration of the module is located on its front panel. The transmission line (Tx) and reception line (Rx) have status LEDs which signal the activity on the respective interface line.

No further configuration of this Serial-Remote interface is necessary.

2.3 Back-up Clock

The module has a maintenance-free, buffered backup clock for at least three days.

After a power failure the clock starts with the internal back-up clock information unless valid time information was available beforehand.

2.4 Voltage Feed

The voltage feed takes place via the integrated power supply in the device.

2.5 Further Signal Outputs

Further available signal outputs of the respective system are stated in the accompanying manual of the specific-device.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3 *hmc* (*hopf* Management Console) software

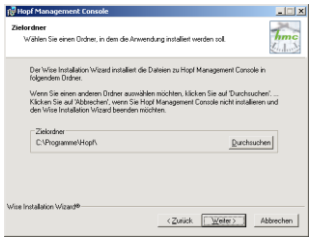
This Chapter describes the operation and functionality of the ***hopf*** **Management Console** (further abbreviated with ***hmc*** software) for the Sync Module 8024GPS.

3.1 Installation on Microsoft Windows

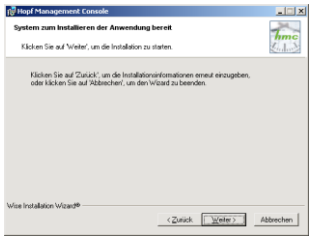
The installation routine is started via a double click on HMC_v01.12_b1182_Windows_install.exe . A query for the installation routine's language will appear - select English and click OK.

The installation wizard has been started now. In the lower area there are three buttons: Back, Forward, Cancel. The Back button allows returning to previous steps at any time, in order to see or change the settings there. If the settings in a step of the installation seem to be in order, the button Forward will lead to the next step. The Cancel button allows leaving the installation wizard at any time, in which case no installation of the ***hmc*** software will be performed on the computer.

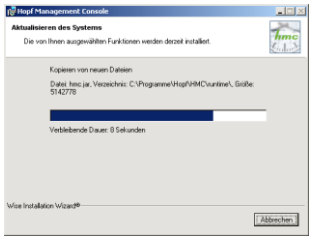
Step 1, The Welcome Screen
Information is shown, partly of a legal kind concerning the licence conditions for the ***hmc*** software. Activating the Forward button implies having read the information and accepting the licence conditions.



Step 2, Installation Directory Selection
Instead of the standard installation directory, on a English language Windows Installation this would be C:\Program Files\Hopf, it is possible to install the ***hmc*** software into any other directory. This allows the parallel installation of different versions.



Step 3, Finalization
In this place, the user is informed that the next activation of the Forward button will start the ***hmc*** software installation process, following the settings made in the previous steps. In case of concordance with these settings, the installation process is to be commenced by activating the Forward button.



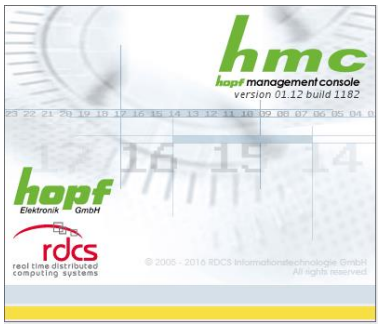
Step 4, The Installation Process
A progress bar indicates how much of the installation process has been accomplished. It is necessary to wait until the installation process is finished.
Cancel allows to cancel the process at any time. In this case, a complete installation will not be performed.

Step 5, Confirmation
The user is informed that the ***hmc*** software has been successfully installed. Activating Finish will close the installation wizard. The ***hmc*** software has now been prepared for use and may be started.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.2 Starting the *hopf* Management Console software

In the Microsoft Windows Start Menu, under *Programs* and in the directory ***hopf***, there is an entry ***hopf Management Console***. A simple click on this entry will start the ***hmc*** software .



Before the ***hmc*** software main window pops up, a splash screen is shown. It contains a visualization of the ***hmc*** software start-up progress.

3.3 The Control Elements

- **A - Menu**: Access to all main features
- **B - Tool Bar**: Fast access to device management and help
- **C - Device Tree**: All integrated devices are visualized here
- **D - Main Area**: The welcome screen and the configuration area of connected devices are shown here.
- **E - Status Bar**: Status information is shown here, to the right there are the language selection and busy indicator.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.3.1 The Menu - Area A

Submenu File

- **Exit**: Closes the ***hmc*** software. In case there are changes not yet transmitted, or devices in a special state, a confirmation dialog is shown before closing.

Sub Menu Devices

- **New**: Integrate a new device. See Opening a device.
- **Remove**: Removes the selected device from the device tree. In case there are changes not yet transmitted, or devices in a special state, a confirmation dialog is shown before removal.
- **Restore Connections**: Restore all devices which have been connected after the last program termination. After program start no device is connected automatically.
- **Connect**: Connect to the unconnected device selected in the device tree.
- **Disconnect**: Close the connection to the connected device selected in the device tree. In case there are changes not yet transmitted, or devices in a special state, a confirmation dialog is shown before disconnecting.
- **Driver Management**: Opens the driver management dialog, which shows details about installed drivers and allows the addition of new drivers. See Driver Management.

Sub Menu Tools

- **View DCF77 Record**: allows opening a DCF77 reception data record file from the file system.
- **Network configuration assistant**: opens the Network Configuration Assistant. See Network Configuration Assistant.
- **NTP Analysis: opens the NTP Analysis dialog**.
- **View GPS Record**: opens the GPS Record dialog.
- **Verbose Logging**: Enables/Disables verbose logging for detailed diagnosis. Should be enabled only in error situations.

Sub Menu Help

- **Info**: Opens the Info Dialog, which shows the ***hmc*** software version number, as well as contact information.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.3.2 The Tool Bar - Area B

Integrate a new device	Like *New* in Menu *Devices*
Remove a device from the tree	Like *Remove* in Menu *Devices*
Reconnect devices	Like *Reconnect Devices* in Menu *Devices*
Connect to a device	Like *Connect* in Menu *Devices*
Disconnect a device	Like *Disconnect* in Menu *Devices*
Show the info dialog	Like *Info* in Menu *Devices*
Show symbol explanations	

3.3.3 The Device Tree - Area C

In the device tree, all devices are shown which are integrated in the ***hmc*** software. The devices may be in connected or disconnected state. The difference is indicated by dictinct icons and font weights.

4465, COM2	Representation of a connected device
7020, COM3	Representation of a disconnected device

All devices are visualized as sub elements of a main element representing the overview panel and serving as a collective indicator showing the presence of not yet transmitted changes, erroneous input and error statuses for connected devices.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.3.4 The Main Area - Area D

In the main area, depending on the element selected in the device tree, either the welcome panel, system overview or the selected device's configuration view is shown.

3.3.5 The Status Bar - Area E

At the left side of the status bar, warnings, error end activity messages are shown. At the right side there is a language selector and a busy indicator showing that communication with a device is taking place. Background communication like error status requests or communication only suited to keep alive connections, is not indicated here.

When another than the active language is selected in the language selector, all shown texts are exchanged to texts in the newly selected language. If a text is not available in the selected language, the generally available English version of the text is shown.

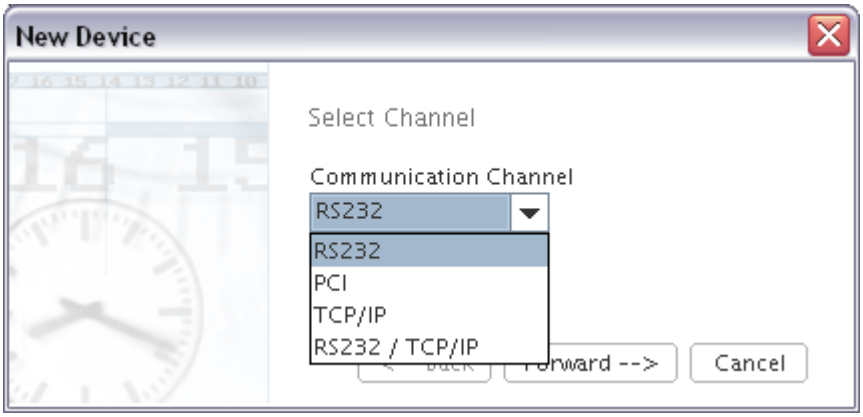
In case there are changes not yet transmitted, or devices in a special state, a confirmation dialog is shown before the language switch is performed.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

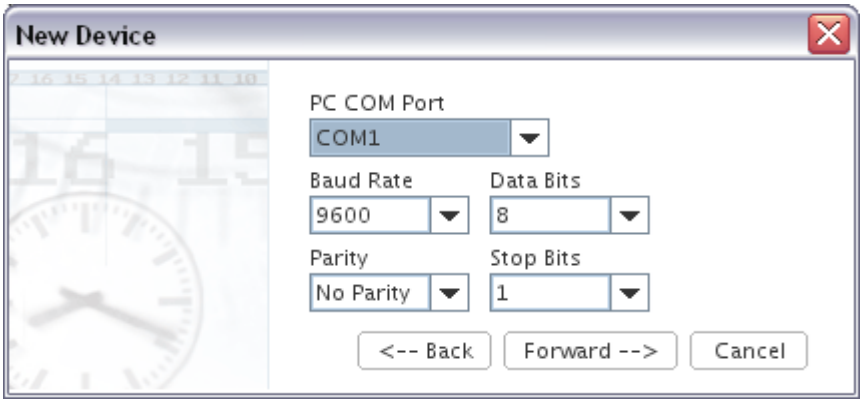
3.4 Create a serial-remote Connection to *hmc* software

After the physical connection has been established via the serial programming cable KA6870 between the Serial-Remote interface of the Sync Module 8024GPS and a free serial interface on the PC, the PC COM port used must be set up.

The menu item *Devices / New* and the Button in the tool bar both open the *New Device* wizard:

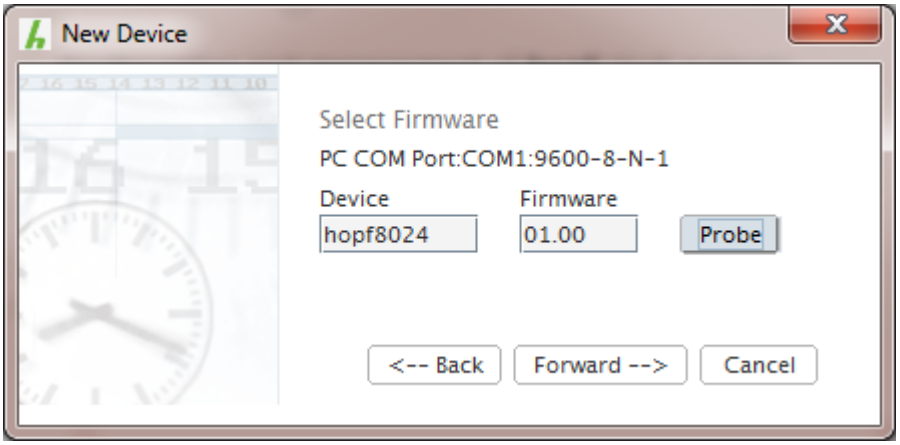


First, the Communication Channel to the device 8024GPS to be opened has to be defined as RS232. ***Forward*** confirms the selection.

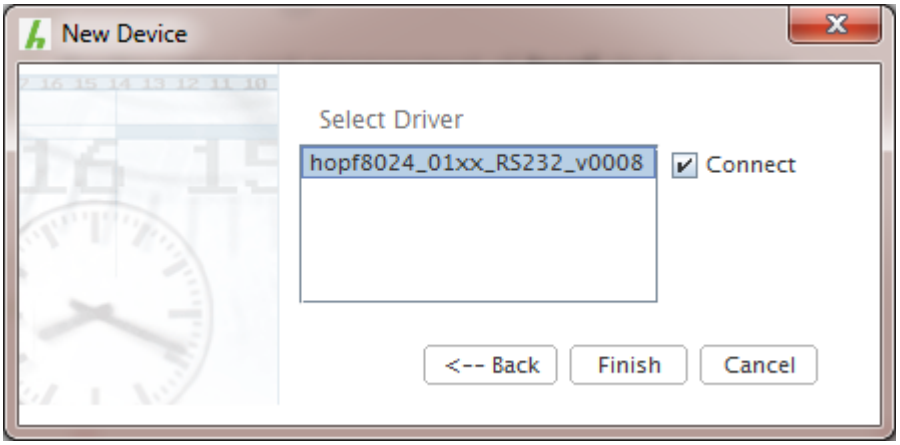


Configuration of computer's serial port with serial parameters (9600-8-N-1, like shown in the screenshot). ***Forward*** confirms the selection.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com



Probe connecting device 8024GPS. ***Forward*** confirms the selection.

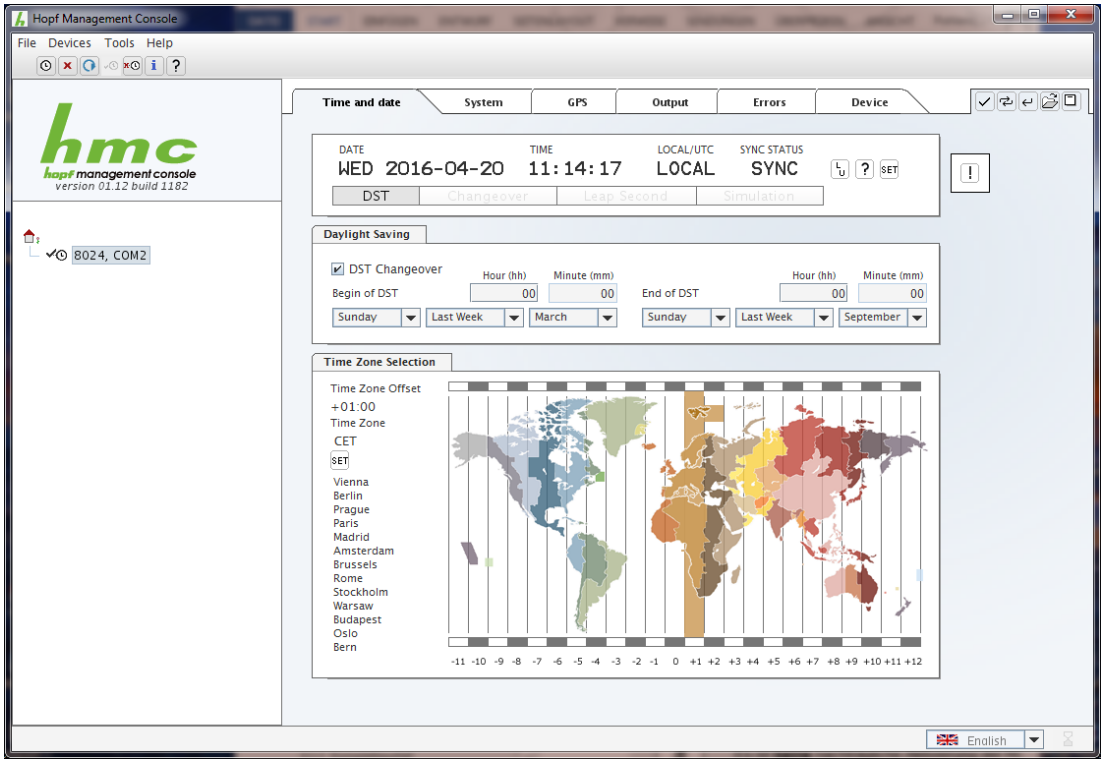


Choice of using device driver. Finish confirms the selection and generate the remote connection to the 8024GPS.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.5 Operation / Display

When the connected device is selected in the device tree, the ***hmc*** software main area shows the configuration view of the connected device.



The configuration view is divided into functional tabs. Click on one of these tabs to navigate through the board. The selected tab is identified by a darker background colour, see the above image (tab "Time and date" in this case).

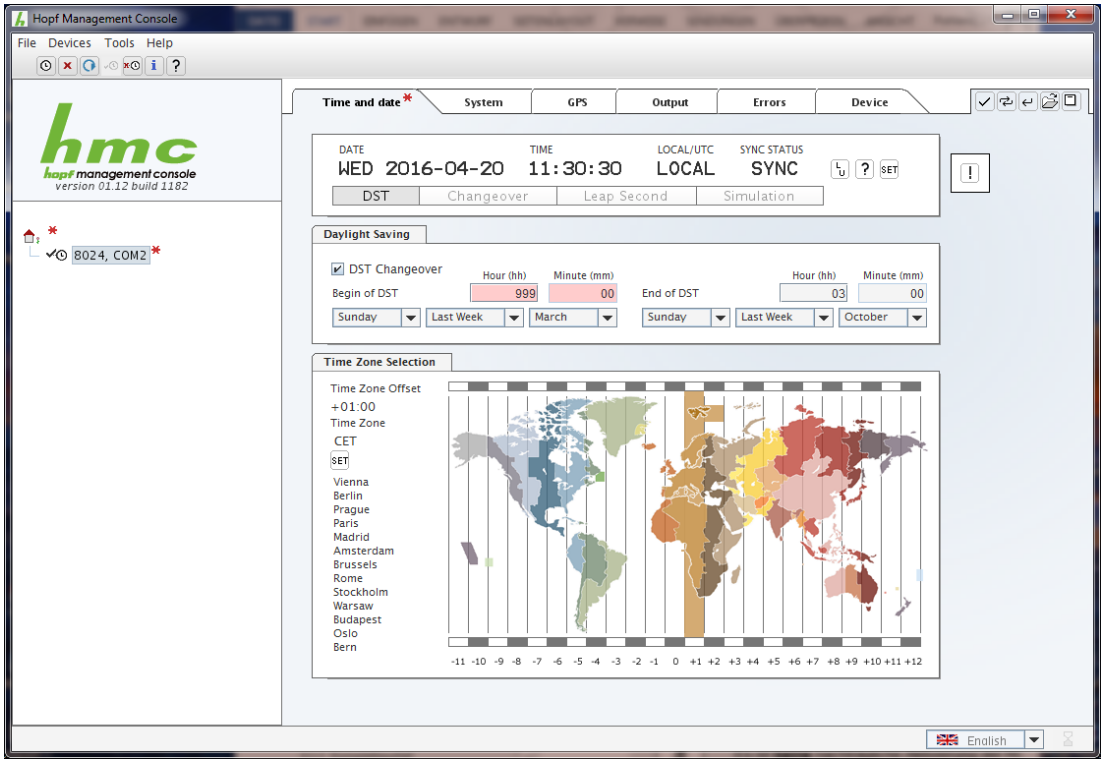
On top and to the right in the configuration view, there is a tool bar for reading and setting device properties, as well as for loading and saving complete configurations.

- Transmit changes to the device.
- Read all configuration properties from the device. Changes not yet transmitted may be lost.
- Undo all recent changes without re-reading from the device.
- Load a complete configuration from a file.
- Save the current configuration to a file.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.5.1 Configuration / Plausibility Check

A reconfigured and not saved parameter is shown with a black changing-asterisk * in the tab and in the device tree.



In case of an invalid input, a red asterisk * will be shown and the causing input control is highlighted with pink background colour.

Transmitting values to a device is not possible whenever an invalid input is present.

3.5.2 Transmit Value Changes

Pushing the button, *transmit changes to device*, all present configuration value changes that have not yet been successfully transmitted to the device are transmitted immediately. The action is going to fail if there are any invalid inputs in any of the device's tabs. In that case, the effort will result in an error dialog. Transmission will always affect all changes in all tabs.

3.5.3 Read from Device

The button, *read all values from device*, causes a complete re-read of all values from the device, losing all eventually present changes that have not yet been transmitted.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.5.4 Undo All Changes

Pushing the button , *undo all changes*, will discard all eventually present changes that have not yet been transmitted without reading the new state from the device.

3.5.5 Load a Configuration File

Pushing the button , *load a configuration file,* starts a file-open-dialog for choosing a configuration file to load into the device. This file must have been saved using the exact same device driver, otherwise loading the configuration is going to fail showing an error dialog.

This file must have been saved using the exact same device driver.

3.5.6 Save the Current Configuration

Pushing the button , *save the current configuration,* starts a file-save-dialog for defining a target file to which the currently active configuration of the device will be saved for later loading into the same or another device using the exact same device driver.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

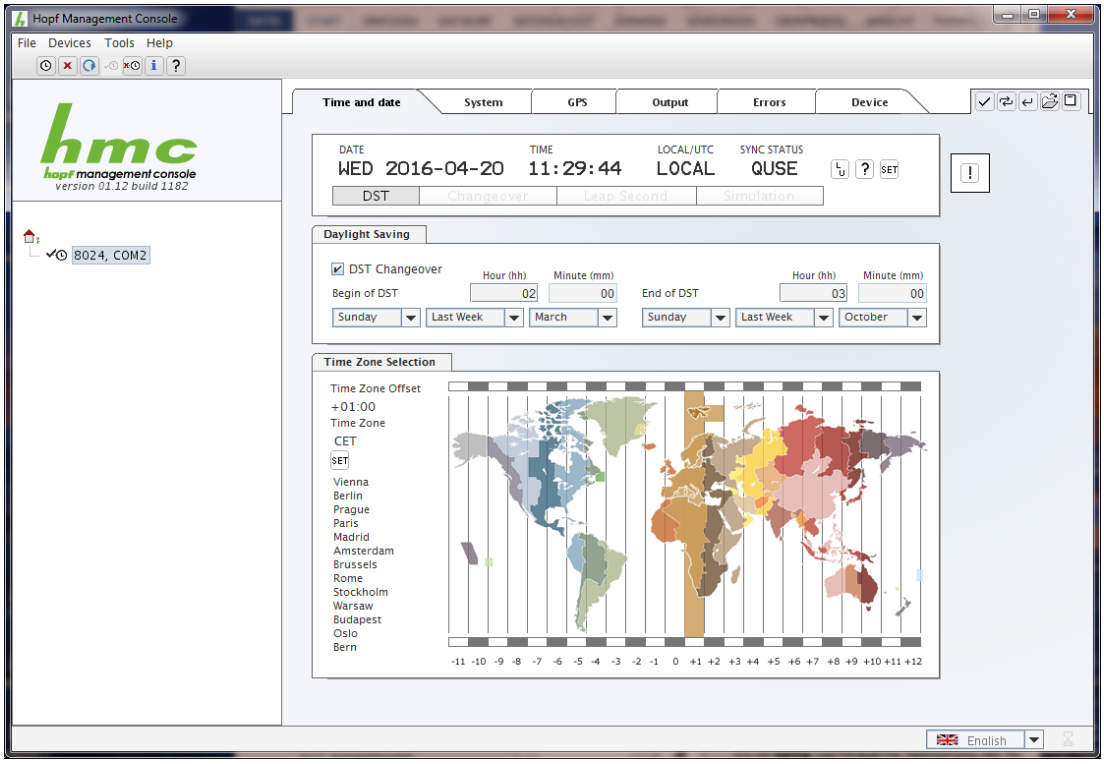
3.6 Description of the Tabs

The ***hmc*** software is divided into the following tabs:

- Time and date
- System
- GPS
- Output
- Errors
- Device

3.6.1 Time and date – Tab

All of the time and status information of the Sync Module 8024GPS is displayed or set in the Time and date tab.



During first commissioning it is mandatorily required to configure the difference time to UTC and the changeover times for summer/winter time or to deactivate them respectively. Otherwise synchronization via GPS will not be possible and the corresponding "Software Errors" are indicated.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.1.1 Time panel

All of the current time and status information is displayed under the Time panel.

A new date/time information can only be set if valid values for the difference time and the daylight saving time are stored.

DATE / TIME

Local Time / UTC

Week day	Mon, Tue, Wen; Thu; Fri, Sat, Sun
Year	2000 ... 2099
Month	01 ... 12
Day	01 ... 31
Hour	00 ... 23
Minute	00 ... 59
Second	00 ... 59

SYNC STATUS

Display of the current status of synchronization of Module 8024GPS with the following possible values:

SYNC	Time synchronized + Quartz regulation started/running
SYOF	Time synchronized + SyncOFF running
SYSI	Time synchronized as simulation mode (without actual GPS reception)
QUON	Quartz/Crystal time + SyncON running
QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
QUSE	Quartz/Crystal time after reset or manual setting
INVA	Invalid time

System Overview

This table gives a direct overview of the current operating states.

Info-Box	Description
DST	When indicated, daylight saving time is active.
Changeover	When indicated, an announcement is active for daylight saving time change-over at the end of the current hour.
Leap second	When indicated, there is an announcement for a leap-second which is going to be inserted at the end of the current hou
Simulation	Some devices support a simulation mode.

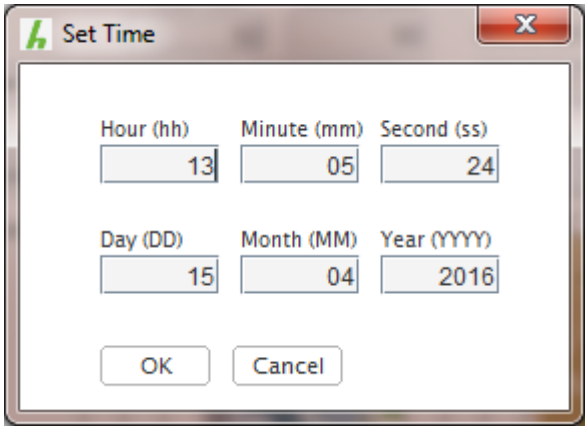
hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

On the right side of the Time panel the following three buttons are located:

- Switch the time display between local time and UTC (Universal Time Coordinated) time
- Quick Help: Explanation of reception quality codes
- Set Date / Time

3.6.1.2 Setting Date and Time

The button SET Set Date / Time opens the *set time dialog*.

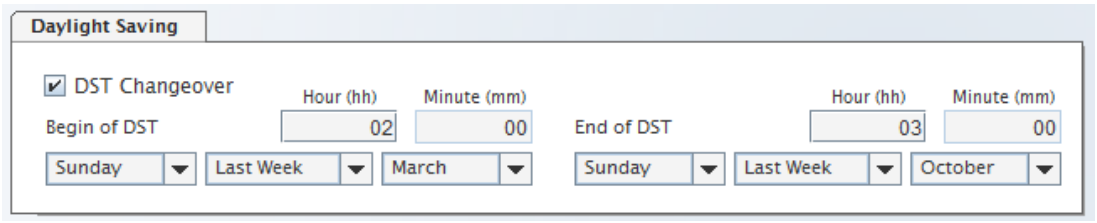


This dialog is initialized with the computer's current time. All values are changeable. After pushing the OK button, the time configuration values will be sent to the clock *immediately*.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.1.3 Daylight Saving panel

The Daylight Saving panel allows the configuration of the points in time for the beginning and the end of the daylight saving time. If daylight saving time shall not be applied the "DST Changeover" checkbox must be deactivated.



The parameters are configurable in such a way that the changeover may be applied at any point in time.

If the DST Changeover checkbox is deactivated local time is calculated without considering daylight saving time. The calculated local time corresponds to standard time which is defined by the time zone offset applied to UTC time.

Value range

DST changeover	active / inactive
Week	first ... fourth, last
Day	Monday ... Sunday
Month	January ... December
Hour	00 ... 23
Minute	00

Sometimes the setting of the last day-of-the-week in December may lead to erroneous results and is therefore not permitted!

Input example for Germany (CET/CEST)

WT (CET) ⇨ ST (CEST) at 2 a.m. on the last Sunday in March.

Input: from **last Sunday** in **March** at **02:00 a.m.**

Changeover WT (Standard / Winter Time) ⇨ ST (Summer Time)

local time	UTC	difference UTC ⇨ local time
01:59:58 h	00:59:58 h	+1 hour
01:59:59 h	00:59:59 h	+1 hour
03:00:00 h	01:00:00 h	+2 hours
03:00:01 h	01:00:01 h	+2 hours

ST (CEST) ⇨ WT (CET) at 3 a.m. on the last Sunday in October.

Input: to **last Sunday** in **October** at **03:00 a.m.**

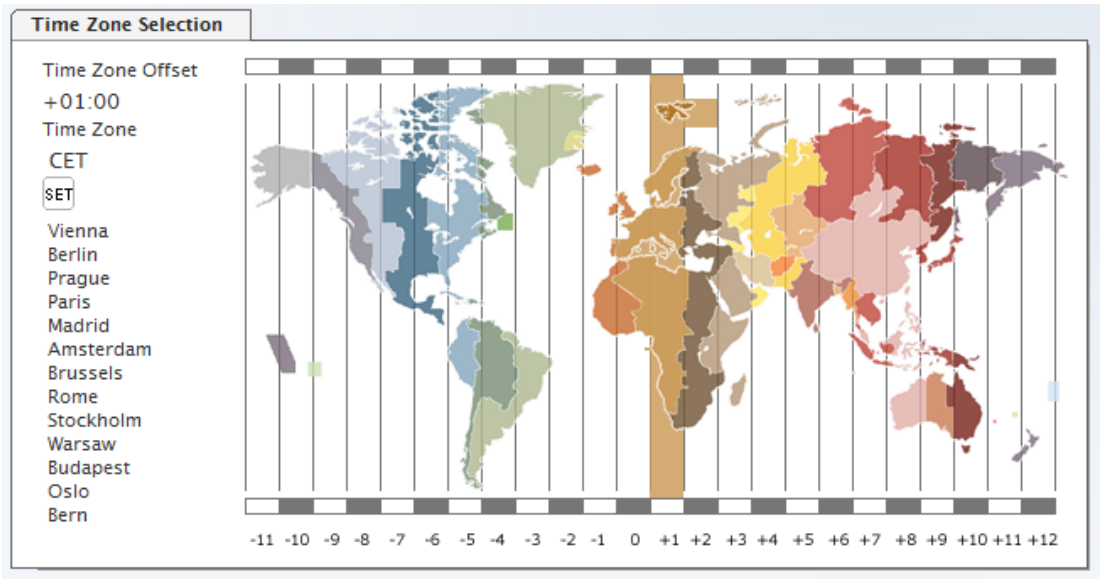
Changeover ST (Summer Time) ⇨ WT (Standard / Winter Time)

local time	UTC	difference UTC ⇨ local time
02:59:58 h	00:59:58 h	+2 hours
02:59:59 h	00:59:59 h	+2 hours
02:00:00 h	01:00:00 h	+1 hour
02:00:01 h	01:00:01 h	+1 hour

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

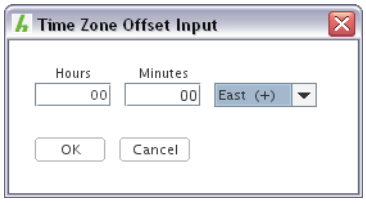
3.6.1.4 Time Zone Selection (Time Zone Offset) panel

The panel is used to configure the time zone offset to UTC time for calculation of local standard time. The operational sign designates the direction of the time zone location in relation to the prime meridian ('+' for east and '-' for west).



Selecting a Time Zone

There are two ways to select a time zone: Either one of the predefined time zones may be selected by moving the mouse over the world map, which implies the limitation that not every theoretically possible time zone offset may be selected. A list of cities within the time zone that is marked in the map helps finding the correct time zone for a certain place on earth. Of course, no warranty of any kind is given for the correctness of these lists and other information, and local time zones are always due to change. Map and lists are merely for convenience.



A time zone can be specified manually too (up to minute precision). For this purpose, the button SET will open a dialog allowing input of the offset as values direction, hours and minutes.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Value range

Operational sign	'+' (east) or '–' (west)
Hours	00 ... 13 – **max. +/- 13:00h**
Minutes	00 ... 59

The operational sign designates the direction in which the local time differs from UTC time:

'+' corresponds to east of the prime meridian (Greenwich)

'-' corresponds to west of the prime meridian (Greenwich)

As most countries of the world select their time offset in whole hours the input is also in steps of one hour:

e.g. + 05:00 or - 11:00

However, some countries operate with smaller time steps; thus minute-by-minute entry is also possible:

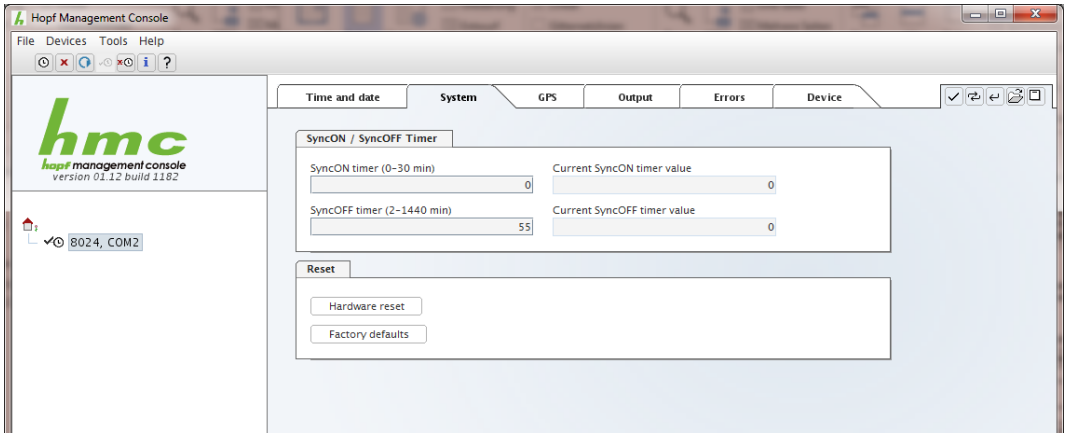
e.g. + 05:30 or - 08:45

Example for Germany:

UTC	Local Time	Time Offset to be set:	Comment
13:00:00	14:00:00 **(winter time)**	+01:00	
13:00:00	15:00:00 **(summer time)**	+01:00	The time difference of two hours is calculated by: +01:00h time zone offset and +01:00h for the daylight saving time offset (changeover points in time must be set).

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.2 System – Tab



3.6.2.1 SyncON / SyncOFF

These timers can be used to delay the change of status from QUARTZ to SYNC (SyncON Timer) and from SYNC to QUARTZ (SyncOFF Timer).

The **SyncOFF** timer is used to bypass reception failure for operation free of fault messages in difficult reception conditions.

In the event of a synchronization source reception failure (GPS in this instance), the re-synchronization of the system to quartz status (QUEX) is delayed by the configured value. The system continues to run in synchronous status (SYOF) on the internally regulated, highly accurate quartz base during this period.

This setting depends primarily on the desired freewheel accuracy.

Example freewheel accuracy calculation

In order to calculate the maximum value to be set for the SyncOFF timer, the desired minimum system accuracy is divided by the freewheel accuracy value of the quartz. If, for example, the freewheel accuracy is 1x10E-6 and the desired minimum system accuracy is 5msec. the following calculation results:

0.005s / 1x10E-6 = 5000s = **83 minutes 20 seconds**

⇨ The **max**. value to be set for the SyncOFF timer is thus **83 minutes**.

The **SyncON** timer is used for systems operating on a highly accurate, regulated quartz base to ensure that the system does not synchronize before the quartz base has been accurately regulated. This timer should be set to **00 as default value** on Module 8024GPS.

Value range

SyncON	00 ... 30 min
SyncOFF	0002 ... 1440 min

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.2.2 Reset

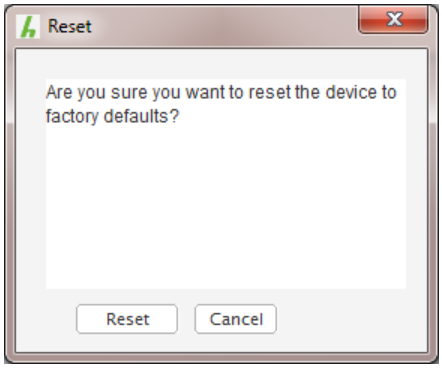
Hardware reset

This button is used to trigger a hardware reset of the module. This leads to a defined restart of the module's microcontroller.

This function has no effect on the failsafe stored data.

Factory defaults

After activating the `Factory defaults` - button and an additional confirmation dialog the settings of Module 8024GPS are reset to factory default.



After setting the Sync Source to factory default values the GPS receiver needs up to 13 minutes of satellite reception in order to generate the correct information on the leap second from the GPS data. Only then the Sync Source (here Module 8024GPS) can be synchronized.

During this time (however only when the GPS receiver really receives satellites) the following message is displayed in the tab **Module Errors**:

GPS Receiver in raw data mode - no synchronisation

As long as the DST changeover times for daylight saving time and the time zone offset are not initially configured after a factory default of the Sync Source (here Module 8024GPS) the following message is displayed in the tab **Module Errors**:

Missing data for Time Zone Offset

and/or

Missing or incomplete data for daylight saving time (DST)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.3 GPS – Tab

In this tab the following information is indicated with read-only access:

Satellites in View

Number of theoretically visible satellites relating to time and location of the GPS receiver.

Satellites Tracked

Effective number of tracked satellites used for synchronization.

Satellites Number – S/N Ratio

Overview of actually tracked GPS satellites showing the satellite identification number and reception quality:

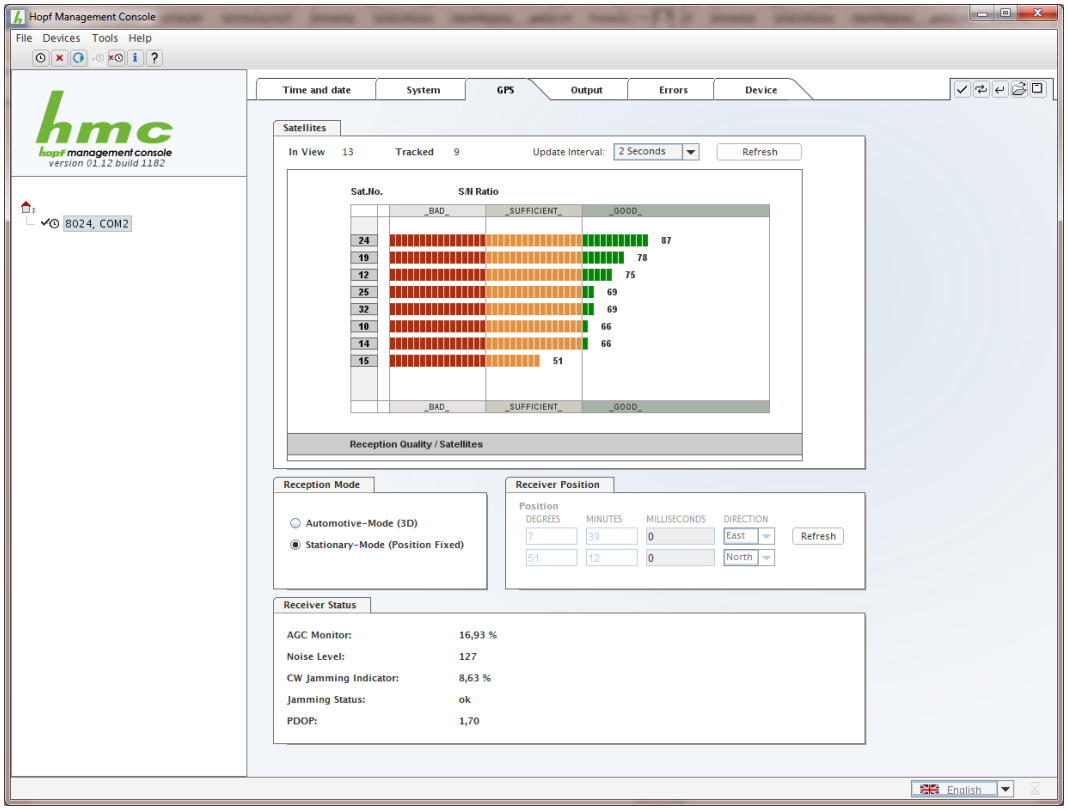
Green	Good reception quality
Yellow	Sufficient reception quality
Red	Poor reception quality

Receiver Position

Display of the actual position calculated by the GPS receiver.

Receiver Status

Display of the internal GPS receiver status values for analysing the GPS receiver in case of support issues.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Reception Mode

In this panel the GPS reception mode is adjusted and displayed. The accuracy of the time evaluation is defined by the exact position calculation of the installation site. For this calculation (3D evaluation) it is necessary to receive information from at least four (4) satellites. The signal runtime to several satellites is determined from the calculated position and the precise second mark is generated from their mean value.

Stationary Mode (Position Fixed) – Standard operation

In Stationary Mode (Fixed position), the GPS receiver calculates its accuracy based on a fixed position. If four or more satellites are received in this mode, the exact location is updated automatically.

In this mode, a synchronization with a changing position is not possible.

Automotive (3D)

The automotive (3D) mode allows the use of Sync Module 8024GPS at mobile locations (except aircraft).

3.6.4 Output – Tab

This Chapter describes the additional functions of Sync Module 8024GPS.

The ***hmc*** software identifies the actual available device specific signal generators and only displays the corresponding tabs like (PPS / DCF77 / IRIG-B / …).

The delivery status of the customer specific device can be found in the accompanying configuration documentation.

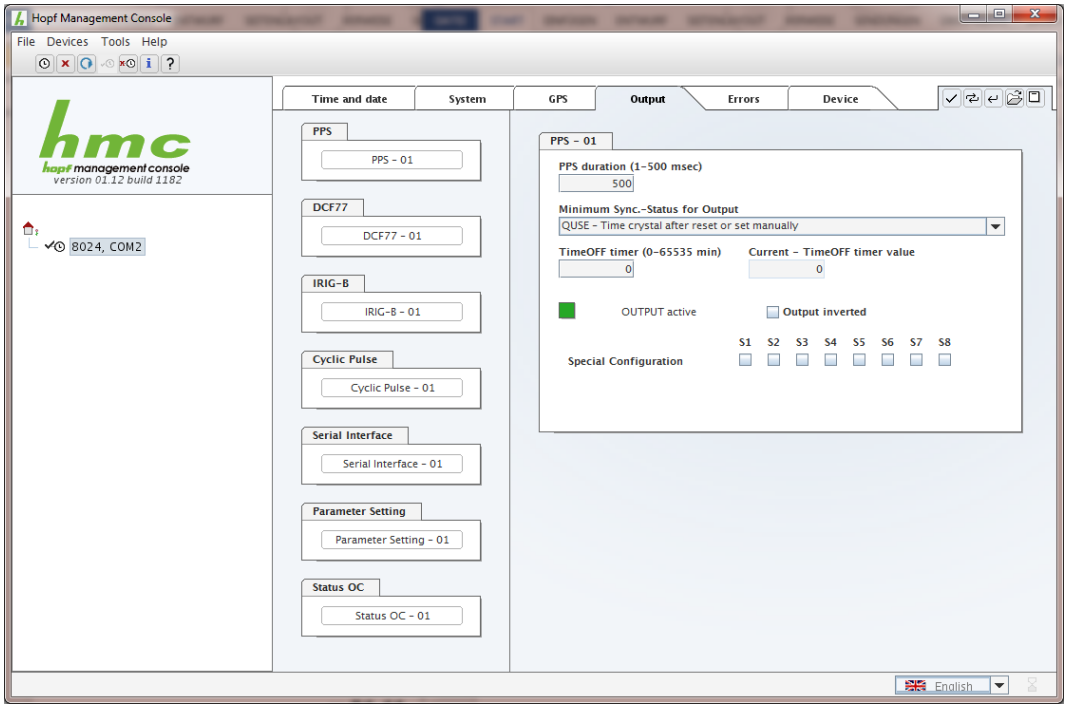
Subsequent activation of the Output functionality is **not** possible on site.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.1 PPS - optional hardware necessary

The signal generation for the output of a PPS pulse (1Hz) may be configured in this panel.

For the output of this signal additional hardware (at system level) is required (see system manual if applicable).



3.6.4.1.1 PPS duration

This section serves to select the pulse width to be transmitted. Basically it is possible to specify the pulse width in milliseconds.

Possible values for the **pulse duration**:

- Minimum: 1 msec
- Maximum: 500 msec

3.6.4.1.2 Minimum Sync.-Status - Status-Dependent Pulse Output

Signal output can be configured only to be generated when the Sync Module 8024GPS has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the configured value.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	**SYNC**	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

3.6.4.1.3 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

3.6.4.1.4 Output inverted – Polarity of the output Pulse

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

3.6.4.1.5 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

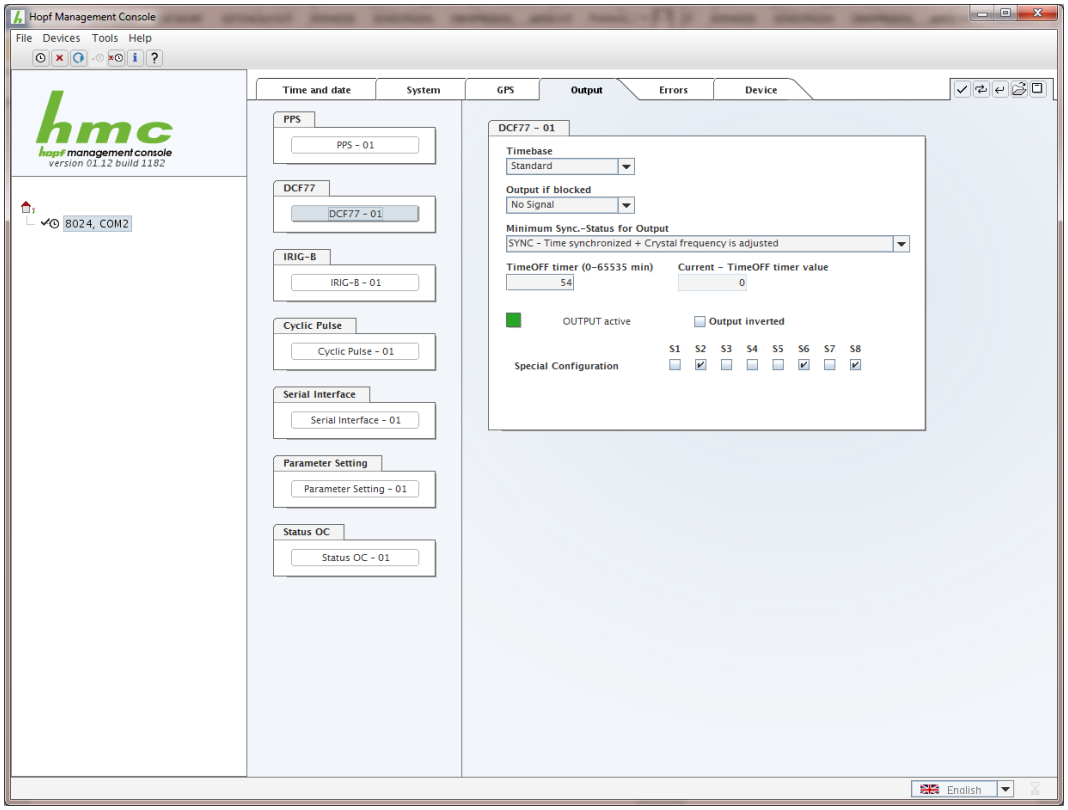
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.2 DCF77 - optional hardware necessary

The signal generation for the output of a DCF77 pulse (1Hz) may be configured in this panel.

For the output of this signal additional hardware (at system level) is required (see system manual if applicable).



3.6.4.2.1 Time Base of the Transmitted DCF77 Pulse

Time Base	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.2.2 Output if blocked - Signal Output in the event of a Fault

Using this menu item the interference reaction of the DCF77 pulse can be controlled unless the system status is lower than the reference value.

Fault signal	**2 Hz Signal:** If the status of Sync Module 8024GPS is lower than the reference value, a 2Hz signal instead of the DCF77 pulse is provided.
	No signal If the status of Sync Module 8024GPS is lower than the reference value there is no signal output.

Transmission of a 2Hz pulse in the event of a fault allows the connected devices to monitor for line breakage.

3.6.4.2.3 Minimum Sync.-Status - Status-Dependent Pulse Output

The signal output can be adjusted only to be generated when the Sync Module 8024GPS has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	**SYNC**	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

3.6.4.2.4 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.2.5 Output inverted – Polarity of the output DCF77 Pulse

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

3.6.4.2.6 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

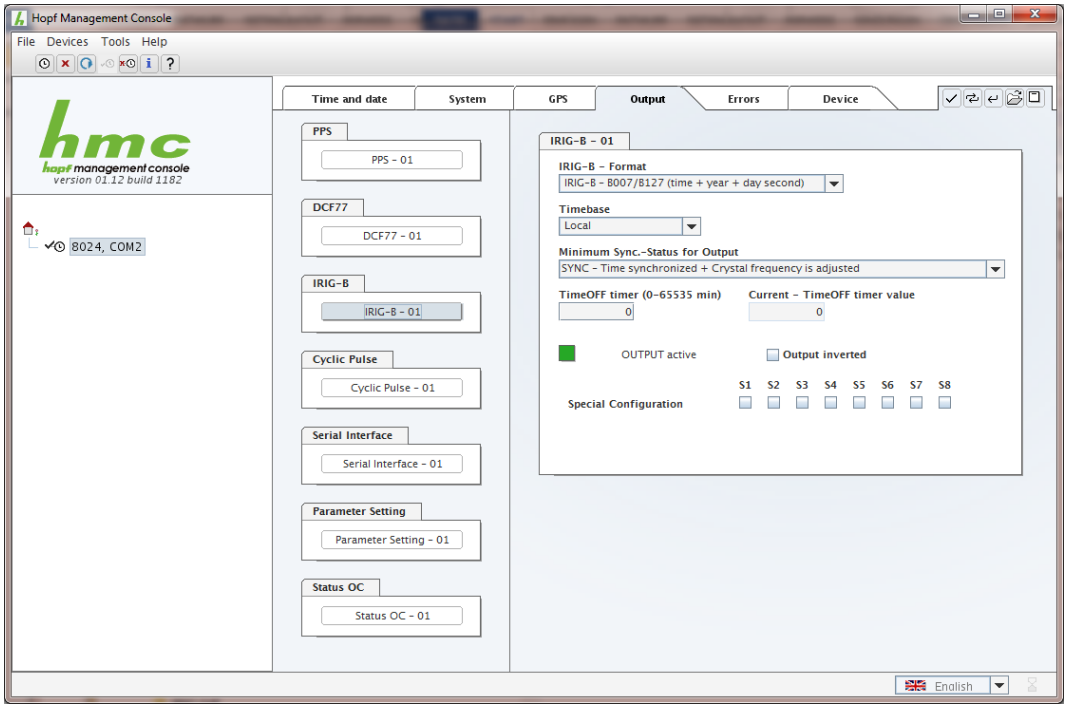
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.3 IRIG-B- optional hardware nesessary

The signal generation for the output of an IRIG-B signal may be configured in this panel.

For the output of this signal additional hardware (at system level) is required (see system manual if applicable).



3.6.4.3.1 Selection of the IRIG-B Format

Following IRIG-B output formats are available:

Selection of Output Format IRIG-B / IEEE C37.118 / AFNOR
IRIG-B / B007+B127 (time, year, second of the day)
IRIG-B / B003+B123(time, second of the day)
IRIG-B / B006+B126 (time, year)
IRIG-B / B002+B122 (time)
IEEE C37.118 (previously IEEE 1344)
AFNOR NF S87-500

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.3.2 Timebase – Timebase of the output IRIG-B Signal

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

3.6.4.3.3 Minimum Sync.-Status - Status-Dependent Pulse Output

The signal output can be adjusted only to be generated when the Sync Module 8024GPS has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	**SYNC**	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

3.6.4.3.4 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.3.5 Output inverted – Polarity of the output Pulse

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

3.6.4.3.6 Special Configuration

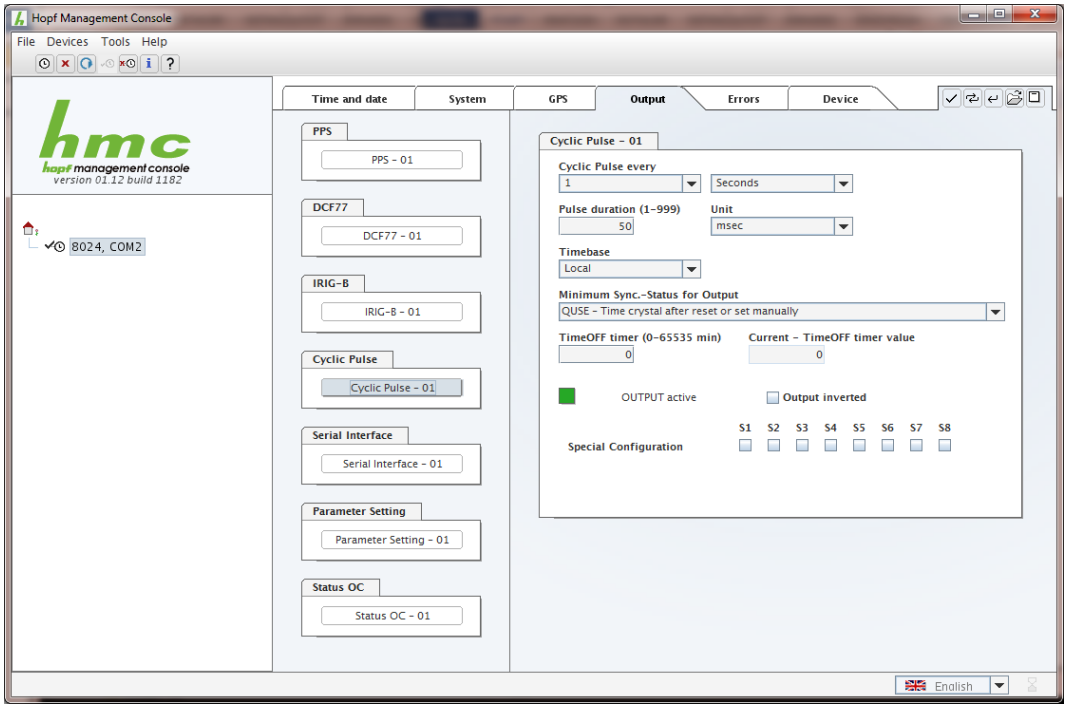
If used, the correct settings are described in the additional system manual of the customer-specific device.

Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

3.6.4.4 Cyclic Pulse - optional hardware nesessary

The signal generation for the output of cyclic pulses may be configured in this panel.

For the output of this signal additional hardware (at system level) is required (see system manual if applicable).



3.6.4.4.1 Cyclic Pulse every

This section is used to select the pulse to be transmitted. Possible pulses are:

- Pulses every second: every 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 seconds
- Pulses every minute: every 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 minutes
- Pulses every hour: every 1, 2, 3, 4, 6, 8, 12 or 24 hours

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.4.2 Pulse duration

This section is used to select the pulse width to be transmitted. Basically it is possible to specify the pulse width in milliseconds or seconds.

Possible values for the **pulse duration**:

- Minimum: 1
- Maximum: 999

Possible values for the **pulse duration unit**:

- Second (sec)
- Millisecond (msec)

Certain inputs are automatically corrected:

- Value > 999 are automatically corrected to 999.
- The pulse lengths must be at least 20msec shorter than the pulse interval.

3.6.4.4.3 Time Base of the Transmitted Cyclic Pulse

Time Base	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

3.6.4.4.1 Minimum Sync.-Status - Status-Dependent Pulse Output

The signal output can be adjusted only to be generated when the Sync Module 8024GPS has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	**SYNC**	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

3.6.4.4.2 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

3.6.4.4.3 Output inverted – Polarity of the output Pulse

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

3.6.4.4.4 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

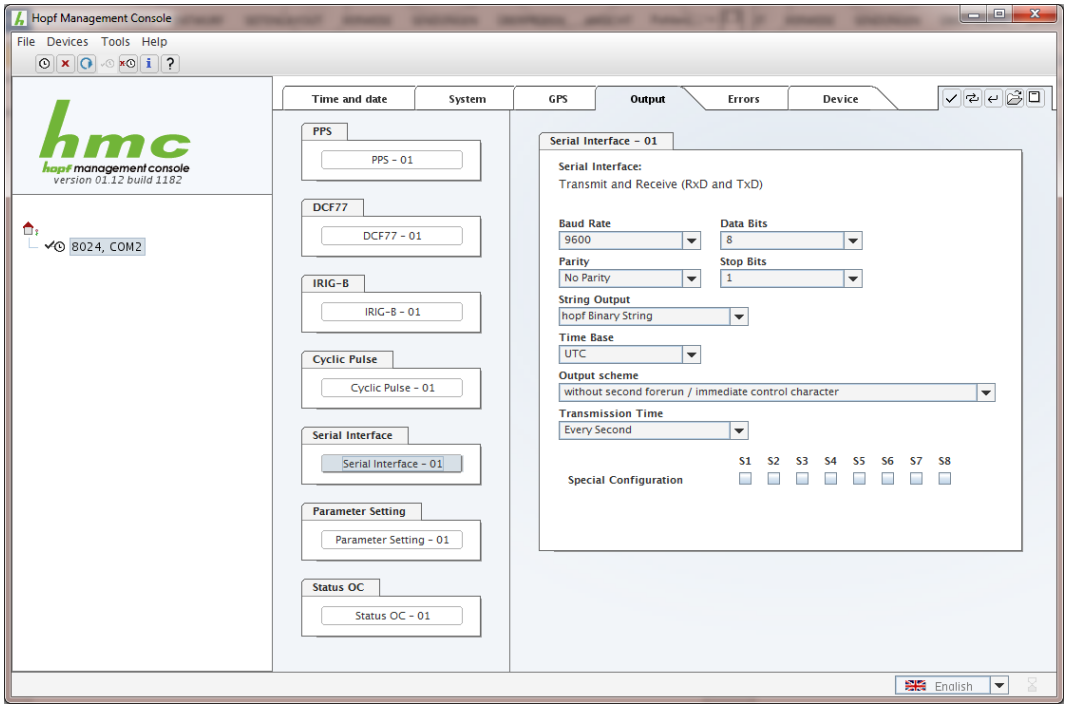
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5 Serial Interface - optional hardware necessary

The serial data string generation may be configured in this panel.

For the output of serial data string additional hardware (at system level) is required (see system manual if applicable).



3.6.4.5.1 Serial Interface parameter

Data strings are available by selection to change automatically the serial parameter.

Baud Rate

- 9600 baud
- 1200 baud
- 4800 baud
- 9600 baud
- 19200 baud
- 38400 baud
- 57600 baud
- 115000 baud

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Data bits

Possible settings are:

- 8 for 8 data bits
- 7 for 7 data bits

Parity

Possible settings are:

- No Parity
- Even Parity
- Odd Parity

Stop Bits

Possible settings are:

- 1 for 1 stop bit
- 2 for 2 stop bits

3.6.4.5.2 Timebase – Timebase of the output serial data string

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

3.6.4.5.3 Output scheme

The output scheme for the transmission must be selected here:

- Without second forerun / immediate control character
- With second forerun / immediate control character
- With second forerun / control character every second
- With second forerun / control character delayed every second

3.6.4.5.4 Transmission Time

- Every Second
- EveryMinute
- Every Hour
- Remote

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.5 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

3.6.4.5.6 String Output

The string output for the transmission must be selected here:

- ***hopf*** Binäry String
- ***hopf*** time Universal
- ***hopf*** Master/Slave-String
- ***hopf*** Standard String (6021)
- Trimble Time String (TSIP)
- SINEC H1 Extended
- SAT 1703 Time String
- ABB Melody (CR/LF)
- ABB Melody (LF/CR)

3.6.4.5.6.1 *hopf* Binary String

The ***hopf*** Binary String can be used to synchronize slave systems with the time data of the master system.

Required:	• Transmision Time every second • With second forerun / control character every second • 9600 baud, 8 bit, 1 stop bit, no parity

Example:

(STX):TIME:80;0233D88F08;07E0;003C;F4108014*6B(CR)(LF) (ETX)

3.6.4.5.6.2 *hopf* time Universal

The ***hopf*** time Universal String can be used to synchronize slave systems with the time data of the master system.

Required:	• Transmision Time every second • With second forerun / control character every second • UTC time • 9600 baud, 8 bit, 1 stop bit, no parity

Example:

(STX)731144501904201602+0000FFFF*23(CR)(LF) (ETX)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.3 *hopf* Master/Slave-String

The ***hopf*** Master/Slave-String can be used to synchronize slave systems with the time data of the master system.

The ***hopf*** Master/Slave-String transmits:

- the full time information (hour, minute, second)
- the date (day, month, year [2 digits])
- the difference time local to UTC (hour, minute)
- the day of the week
- status information (announcement of DST changeover, announcement of a leap second and the status of reception of the ***hopf*** Master/Slave-String source)

3.6.4.5.6.3.1 Specified Settings

Required:	The following settings are required for the synchronization of the ***hopf*** slave-systems: • Normally points of time every minute, depending on system also every second • output second forerun • ETX on the second change; selectable: data string at the beginning or at the end of the 59. second. • local time • 9600 baud, 8 bit, 1 stop bit, no parity

Received data on the serial interface that are not specified in the pertinent data string might disturb and interrupt the cyclic string output.
The receiving synchronization interface should be set to "transmitting on request" for Sub-Master (Slave) Systems.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.3.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status	$30-39, $41-46
3	day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	difference time tens hour / operational sign	$30-31, $38-39
17	difference time unit hour	$30-39
18	difference time tens minutes	$30-35
19	difference time unit minutes	$30-39
20	LF (line feed)	$0A
21	CR (carriage Return)	$0D
22	ETX (end of text)	$03

The difference time (time zone offset) is transmitted in hours and minutes following the year. The transmission is done in BCD. The difference time may be up to ± 14.00h.

The operational sign is shown as the highest bit in the hours.

logic **1** = local time before UTC
logic **0** = local time after UTC

Example:

Data String	Tens Difference Time Nibble	Difference Time
(STX)831234560301960300(LF)(CR)(ETX)	**0000**	- 03:00h
(STX)831234560301961100(LF)(CR)(ETX)	**0001**	- 11:00h
(STX)831234560301968230(LF)(CR)(ETX)	**1000**	+ 02:30h
(STX)831234560301969100(LF)(CR)(ETX)	**1001**	+ 11:00h

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.3.3 Status

	b3	b2	b1	b0		Meaning
Status:	x	x	x	0		no announcement hour
	x	x	x	1		announcement (DST changeover)
	x	x	0	x		standard time
	x	x	1	x		daylight saving time (DST)
	x	0	x	x		no announcement leap second
	x	1	x	x		announcement leap second
	0	x	x	x		synchronization status code: INVA / QUSE / QUEX / QUON
	1	x	x	x		synchronization status code: SYOF / SYNC
Day of the Week:	0	0	0	1		Monday
	0	0	1	0		Tuesday
	0	0	1	1		Wednesday
	0	1	0	0		Thursday
	0	1	0	1		Friday
	0	1	1	0		Saturday
	0	1	1	1		Sunday

Status	Operating Mode	Time	DST changeover	Leap Second
0 = 0000	INVA / QUSE / QUEX / QUON	standard time	no announcement	no announcement
1 = 0001	INVA / QUSE / QUEX / QUON	standard time	announcement	no announcement
2 = 0010	INVA / QUSE / QUEX / QUON	DST	no announcement	no announcement
3 = 0011	INVA / QUSE / QUEX / QUON	DST	announcement	no announcement
4 = 0100	INVA / QUSE / QUEX / QUON	standard time	no announcement	announcement
5 = 0101	INVA / QUSE / QUEX / QUON	standard time	announcement	announcement
6 = 0110	INVA / QUSE / QUEX / QUON	DST	no announcement	announcement
7 = 0111	INVA / QUSE / QUEX / QUON	DST	announcement	announcement
8 = 1000	SYOF / SYNC	standard time	no announcement	no announcement
9 = 1001	SYOF / SYNC	standard time	announcement	no announcement
A = 1010	SYOF / SYNC	DST	no announcement	no announcement
B = 1011	SYOF / SYNC	DST	announcement	no announcement
C = 1100	SYOF / SYNC	standard time	no announcement	announcement
D = 1101	SYOF / SYNC	standard time	announcement	announcement
E = 1110	SYOF / SYNC	DST	no announcement	announcement
F = 1111	SYOF / SYNC	DST	announcement	announcement

DST = daylight saving time

3.6.4.5.6.3.4 Example

(STX)841234561807028230(LF)(CR)(ETX)

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- synchronization status code: SYNC
- no announcement of a changeover
- The difference time to UTC is +2.30 h

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.4 *hopf* Standard String (6021)

Below the *hopf* Standard String is described.

3.6.4.5.6.4.1 Specified Settings

Required:	**no**

3.6.4.5.6.4.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.4.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
`0 = 0000`	INVA	winter	no announcement
`1 = 0001`	INVA	winter	announcement
`2 = 0010`	INVA	summer	no announcement
`3 = 0011`	INVA	summer	announcement
`4 = 0100`	QUSE / QUEX / QUON	winter	no announcement
`5 = 0101`	QUSE / QUEX / QUON	winter	announcement
`6 = 0110`	QUSE / QUEX / QUON	summer	no announcement
`7 = 0111`	QUSE / QUEX / QUON	summer	announcement
`8 = 1000`	SYOF	winter	no announcement
`9 = 1001`	SYOF	winter	announcement
`A = 1010`	SYOF	summer	no announcement
`B = 1011`	SYOF	summer	announcement
`C = 1100`	SYNC	winter	no announcement
`D = 1101`	SYNC	winter	announcement
`E = 1110`	SYNC	summer	no announcement
`F = 1111`	SYNC	summer	announcement

3.6.4.5.6.4.4 Example

(STX)E4123456180702(LF)(CR)(ETX)

- It is Thursday 18.07.2002 - 12:34:56 o'clock.
- synchronization status code: SYNC
- daylight saving time
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.5 Trimble Time String (TSIP)

The Trimble Time String (TSIP) can be used to synchronize slave systems with the time data of the master system.

Example in Hex description (not ASCII):

10 8F 0B 00 00 41 0A 49 00 00 00 00 00 13 04 07 E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 10 03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.6 SINEC H1 Extended

Below the data string SINEC H1 Extended is described.

String request

The data string SINEC H1 Extended can also be sent by request. The time of output shall be configured to "send only by request" and the string will shall be requested with the ASCII character **"?"**.

3.6.4.5.6.6.1 Specified Settings

Required:	**no**

3.6.4.5.6.6.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	"D" ASCII D	$44
3	":" colon	$3A
4	tens day	$30-33
5	unit day	$30-39
6	"." point	$2E
7	tens month	$30-31
8	unit month	$30-39
9	"." point	$2E
10	tens year	$30-39
11	unit year	$30-39
12	";" semicolon	$3B
13	"T" ASCII T	$54
14	":" colon	$3A
15	day of the week	$31-37
16	";" semicolon	$3B
17	"U" ASCII U	$55
18	":" colon	$3A
19	tens hour	$30-32
20	unit hour	$30-39
21	"." point	$2E
22	tens minute	$30-35
23	unit minutes	$30-39
24	"." point	$2E
25	tens second	$30-36
26	unit second	$30-39
27	";" semicolon	$3B
28	"#" or " " (space)	$23 / $20
29	"*" or " " (space)	$2A / $20
30	"S", "U" or " " (space)	$53 / $55 / $20
31	"!", "A" or " " (space)	$21 / $41 / $20
32	ETX (end of text)	$03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.6.3 Status

The characters 28-31 in the data string SINEC H1 Extended tell the synchronization status of the Sync Module 8024GPS.

The characters mean the following:

character no. 28 =	"#"	no synchronisation after reset, time invalid "synchronization status code: INVA"
	" " (space)	synchronisation after reset, clock in crystal operation "synchronization status code: QUSE / QUEX / QUON / SYOF / SYNC"
character no. 29 =	"*"	time from internal crystal in the clock "synch. status code: INVA / QUSE / QUEX / QUON"
	" " (space)	time by synchronisation "synchronization status code: SYOF / SYNC"
character no. 30 =	"S"	daylight saving time
	"U"	UTC
	" " (space)	standard time
character no. 31 =	"!"	announcement of a DST or standard time changeover
	"A"	announcement of a leap second
	" " (space)	no announcement

3.6.4.5.6.6.4 Example

(STX)D:18.07.02;T:4;U:12.34.56; _ _ _ _ **(ETX)** (_) = Space

- It is Thursday 18.07.02 - 12:34:56 o'clock
- The clock is synchronous (synchronization status code: SYNC)
- standard time (winter time)
- no announcement of a changeover

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.7 SAT 1703 Time String

All modes can be transmitted with the SAT 1703 Time String (e.g. with forerun or end character at second change).

The SAT 1703 Time String can also be sent on request. The point of transmission shall be set to "transmission on request". The SAT 1703 Time String may be requested with ASCII-character **"?"**.

3.6.4.5.6.7.1 Specified Settings

Required:	**no**

3.6.4.5.6.7.2 Structure

Character No.	Meaning		Hex-Value
1	STX (start of text)		$02
2	tens day		$30-33
3	unit day		$30-39
4	"."		$2E
5	tens month		$30-31
6	unit month		$30-39
7	"."		$2E
8	tens year		$30-39
9	unit year		$30-39
10	"/"		$2F
11	unit day of the week		$31-37
12	"/"		$2F
13	tens hours		$30-32
14	unit hours		$30-39
15	":"		$3A
16	tens minutes		$30-35
17	unit minutes		$30-39
18	":"		$3A
19	tens seconds		$30-35
20	unit seconds		$30-39
21	"M" or "M" or "U"	(Standard time, Daylight saving time or UTC)	$4D, $4D, $55
22	"E" or "E" or "T"		$45, $45, $54
23	"Z" or "S" or "C"		$5A, $53, $43
24	" " or "Z" or " "		$20, $5A, $20
25	" " ($20 ⇨ synchronous) or "*" ($2A ⇨ not synchronous)		$20 $2A
26	" " ($20 ⇨ no announcement) or "!" ($21 ⇨ announcement of a DST or standard time changeover)		$20 $21
27	CR (carriage return)		$0D
28	LF (line feed)		$0A
29	ETX		$03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.7.3 Status

The characters 21-26 in the SAT 1703 Time String indicate the synchronisation status of the clock.

The characters mean the following:

Character no. 21-24 =	"MESZ"	Central European Summertime (Daylight Saving Time)
	"MEZ "	Central European Time (standard time / winter time)
	"UTC "	Coordinated Universal Time
Character no. 25 =	"*"	time from internal crystal in the clock “synchronization status code: INVA / QUSE / QUEX / QUON”
	" " (space)	time by synchronisation “synchronization status code: SYOF / SYNC”
Character no. 26 =	"!"	announcement of a DST or standard time changeover
	" " (space)	no announcement

3.6.4.5.6.7.4 Example

(STX)18.07.02/4/02:34:45UTC___(CR)(LF)(ETX)

- It is Thursday 18.07.02 - 02:34:45 o'clock UTC
- The clock is synchronous (synchronization status code: SYNC)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.8 ABB Melody (CR/LF)

Below the ABB Melody DataString is described.

3.6.4.5.6.8.1 Specified Settings

Required:	The following settings are required for the synchronization: • Output every minute • Output without second forerun • Output without ETX on the second change • UTC time • 9600 baud, 8 bit, 2 stop bit, parity even

3.6.4.5.6.8.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	CR (carriage return)	$0D
17	LF (line feed)	$0A
18	ETX (end of text)	$03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.8.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
0 = 0000	INVA	winter	no announcement
1 = 0001	INVA	winter	announcement
2 = 0010	INVA	summer	no announcement
3 = 0011	INVA	summer	announcement
4 = 0100	QUSE / QUEX / QUON	winter	no announcement
5 = 0101	QUSE / QUEX / QUON	winter	announcement
6 = 0110	QUSE / QUEX / QUON	summer	no announcement
7 = 0111	QUSE / QUEX / QUON	summer	announcement
8 = 1000	SYOF	winter	no announcement
9 = 1001	SYOF	winter	announcement
A = 1010	SYOF	summer	no announcement
B = 1011	SYOF	summer	announcement
C = 1100	SYNC	winter	no announcement
D = 1101	SYNC	winter	announcement
E = 1110	SYNC	summer	no announcement
F = 1111	SYNC	summer	announcement

3.6.4.5.6.8.4 Example

(STX)CC123456210416(CR)(LF)(ETX)

- It is Thursday 21.04.2016 - 12:34:56 o'clock.
- synchronization status code: SYNC
- UTC
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.9 ABB Melody (LF/CR)

Below the ABB Melody DataString is described.

3.6.4.5.6.9.1 Specified Settings

Required:	The following settings are required for the synchronization: • Output every minute • Output without second forerun • Output without ETX on the second change • UTC time • 9600 baud, 8 bit, 2 stop bit, parity even

3.6.4.5.6.9.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.5.6.9.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
0 = 0000	INVA	winter	no announcement
1 = 0001	INVA	winter	announcement
2 = 0010	INVA	summer	no announcement
3 = 0011	INVA	summer	announcement
4 = 0100	QUSE / QUEX / QUON	winter	no announcement
5 = 0101	QUSE / QUEX / QUON	winter	announcement
6 = 0110	QUSE / QUEX / QUON	summer	no announcement
7 = 0111	QUSE / QUEX / QUON	summer	announcement
8 = 1000	SYOF	winter	no announcement
9 = 1001	SYOF	winter	announcement
A = 1010	SYOF	summer	no announcement
B = 1011	SYOF	summer	announcement
C = 1100	SYNC	winter	no announcement
D = 1101	SYNC	winter	announcement
E = 1110	SYNC	summer	no announcement
F = 1111	SYNC	summer	announcement

3.6.4.5.6.9.4 Example

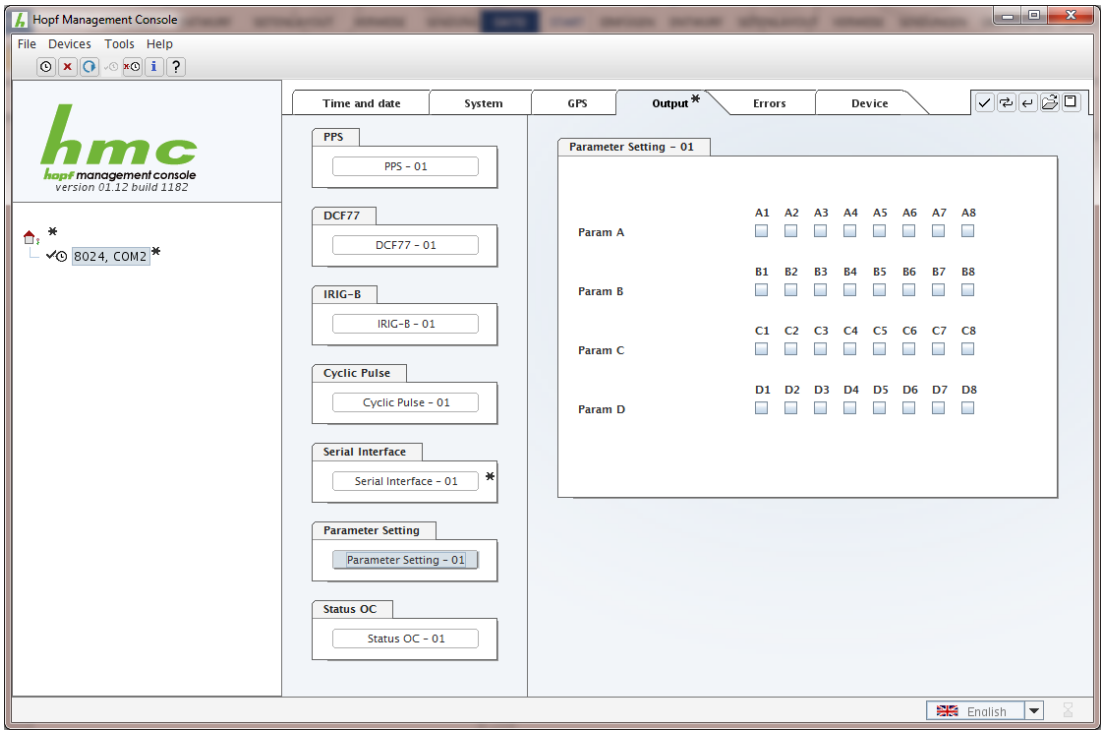
(STX)CD123456220416(LF)(CR)(ETX)

- It is Friday 22.04.2016 - 12:34:56 o'clock.
- synchronization status code: SYNC
- UTC
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.6 Parameter Setting - optional hardware necessary

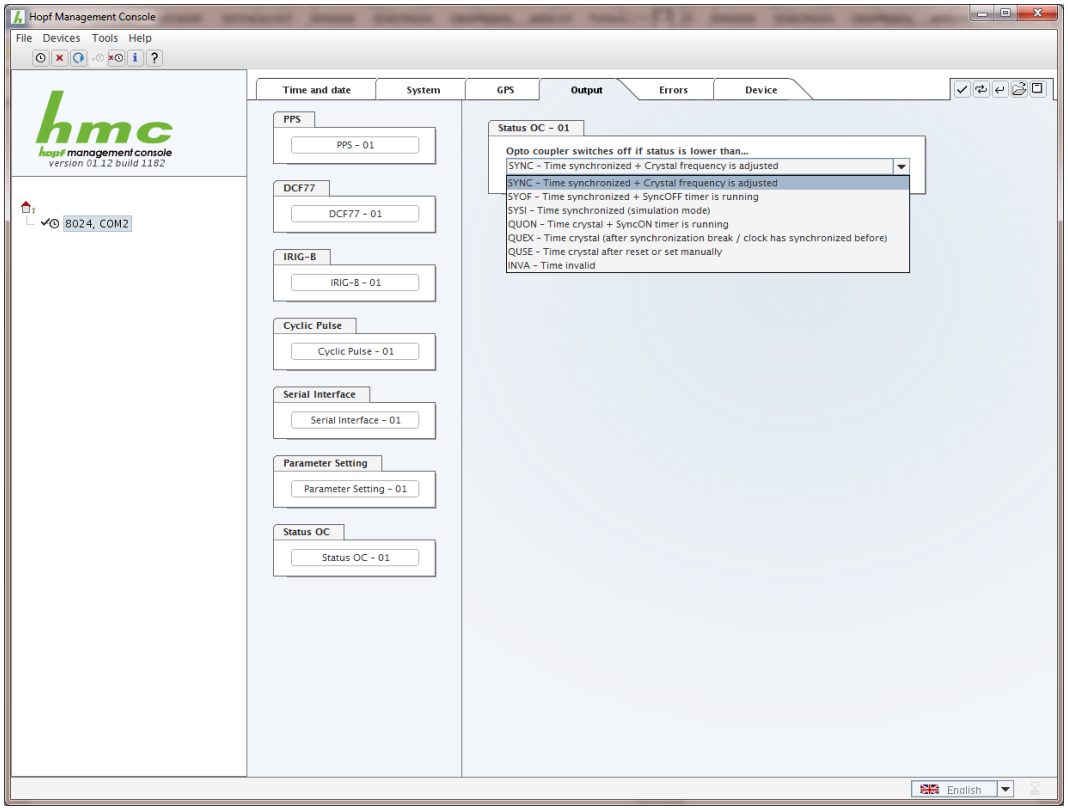
Panel for the additional configuration.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.4.7 Status OC

The output of the synchronization status via optical coupler (on the front panel of Sync Module 8024GPS) may be configured with this panel.



The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Optical coupler:

- Selected status or better achieved – Optical coupler switched through
- Selected status not achieved – Optical coupler blocked

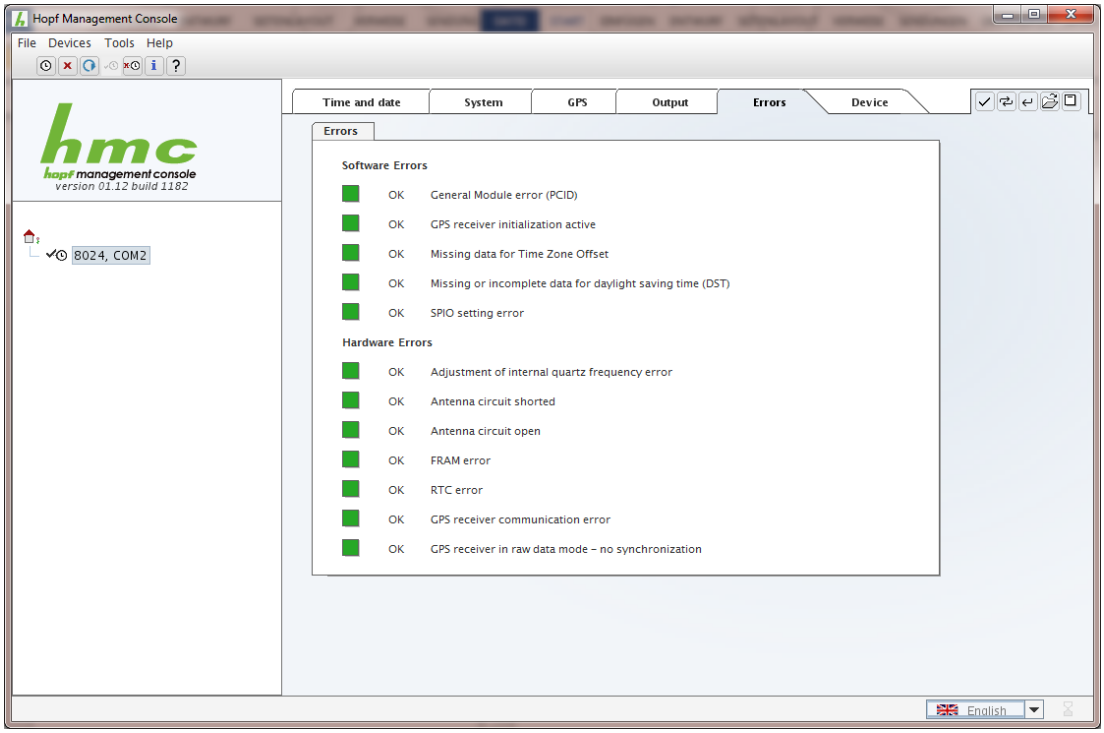
Value range

Optical Coupler Status	**SYNC**	Time synchronized + Quartz regulation started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (without actual GPS reception)
	QUON	Quartz/Crystal time + SyncON running
	QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/Crystal time after reset or manual setting
	INVA	Invalid time

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.5 Errors – Tab

This tab displays the current failure status of the Sync Module 8024GPS:



Overview Software Errors

- **General Module error (PCID)**

  If this error occurs even after a Power down, the device is damaged.

- **GPS receiver initialization active**

  This condition might last for max. 1 minute after particular actions.

- **Missing data for Time Zone Offset**

  Difference time (Time Zone Offset) must be initially configured by the user.

  Otherwise no synchronization of the Sync Source (here Module 8024GPS) is possible.

- **Missing or incomplete data for daylight saving time (DST)**

  The switchover times for summer/winter time must be initially configured / disabled by the user.

  Otherwise no synchronization of the Sync Source (here Module 8024GPS) is possible.

- **SPIO setting error**

  If this error occurs even after a voltage reset, the support team of company ***hopf*** needs to be contacted for further actions.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Overview Hardware Errors

- **Adjustment of internal quartz frequency error**

  Problems with the internal quartz regulation of the Sync Source (here Module 8024GPS) have occurred. So the specified accuracy of the Sync Source cannot be guaranteed anymore.

- **Antenna circuit shorted**

  The Sync Source (here Module 8024GPS) has detected a short circuit in the antenna system. The antenna system should be checked.

- **Antenna circuit open**

  The Sync Source (here Module 8024GPS) has detected an open antenna input. The antenna system should be checked.

- **FRAM error**

  If this error occurs even after a voltage reset, the support team of company ***hopf*** needs to be contacted for further actions.

- **RTC error**

  If this error occurs when time is configured or synchronized (synchronization status is not INVA) and and even after a reset of the Sync Source (here Module 8024GPS) the internal backup clock may be defective.

- **GPS receiver communication error**

  If this error occurs even after a Power-Reset, the support team of company ***hopf*** needs to be contacted for further actions.

- **GPS receiver in raw data mode – no synchronization**

  If this condition is indicated, the GPS receiver requires special data from the GPS signal for which it needs up to 13 minutes signal reception of satellites. Only then the Sync Source (here Module 8024GPS) can be synchronized.

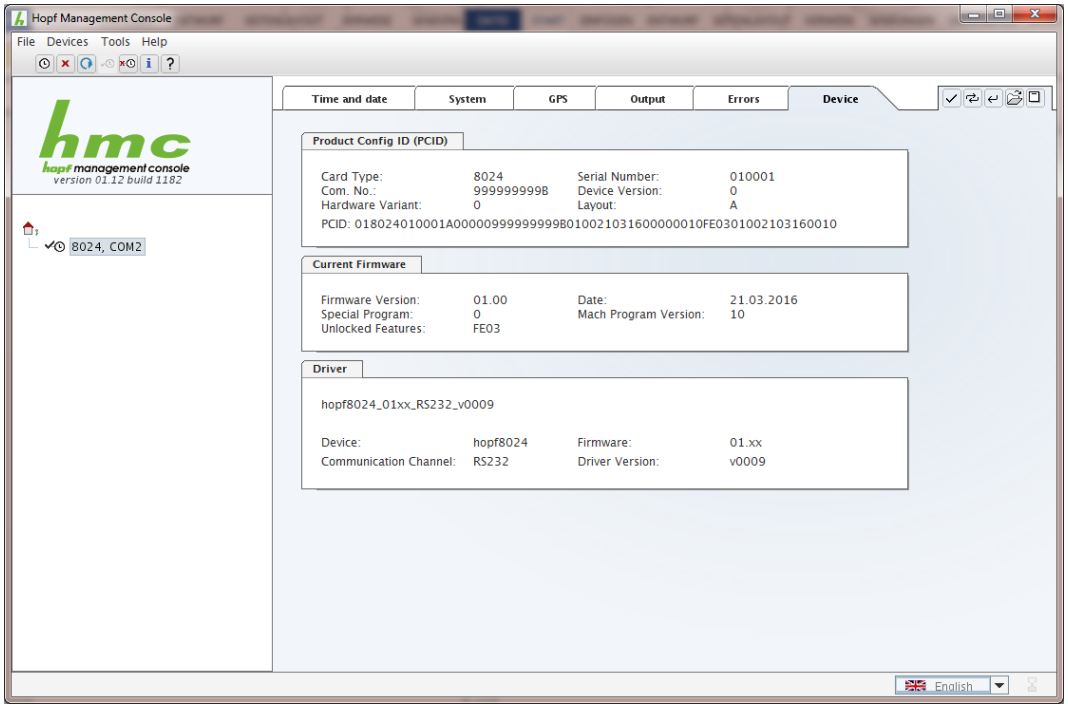
  This happens e.g. after resetting the Sync Source parameters to factory default values.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

3.6.6 Device – Tab

This tab indicates information about the hardware and software of the Module 8024GPS (Sync Source).

These details might be provided for service and support purposes.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

4 Fault Analysis / Troubleshooting

Various indicators are available on the Sync Module 8024GPS for representation of the system status and problem analysis. This status information can also be used to monitor the clock system by means of a higher level management systems.

4.1 Fault Scenarios

This chapter describes various fault scenarios for initial analysis of the problem by the user. It also provides assistance in describing the fault when contacting the ***hopf*** support team.

4.1.1 Complete Failure

Description

- The status LED's on the front panel are off

Cause / Solution

- Equipment is switched off
- Power supply has failed
- Power supply unit is defective

4.1.2 No GPS Reception / No Synchronization

Description

- **SY**xx is not displayed on the status display of the time tab in the ***hmc*** software
- The status LED's on the front panel do not signal any **SY**xx status

Cause / Solution

- System was not initialized correctly or initialization was incomplete

The following describes various effects and their possible causes in the case of a non-synchronizing system:

Case 1:

Effect: No satellite appears on tab GPS of ***hmc*** software after first installation and **00** is displayed under **In View**.

Possible faults:

* The antenna cable is too long
* An incorrect type of cable was used for the antenna cable length
* The antenna cable is faulty
* The antenna cable is not connected
* The antenna is faulty
* The indirect lightning protector is faulty

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Case 2:

Effect: There are 7 satellites within the range of visibility (**In View=07**) but only a maximum of 2 are displayed in the GPS tab. However, the values of these satellites are 50 or higher.

Possible fault:

* The visibility range of the antenna to the sky is restricted.

Case 3:

Effect: 9 satellites in the range of visibility (**In View=09**), 6 satellites appear in the GPS tab. The signal to noise ratios are all less than 30. The module does not synchronize.

Possible faults:

* The cable is too long
* An incorrect type of cable was used for the length of the antenna equipment
* The BNC sockets are not mounted correctly
* The cable is kinked or broken
* The indirect lightning protector is faulty
* Faulty antenna

Case 4:

Effect: The module was working well previously but there has been no reception for several days. There are 7 satellites in the range of visibility (**In View=7**). However, no satellite is displayed.

Possible faults:

* The cable is damaged.
* There was excess voltage on the antenna equipment and the lightning protection is damaged.
* The antenna is faulty.
* The GPS receiver on the Sync Module 8024GPS is faulty.
* A constructional change has had an effect on the antenna equipment (e.g. shading of the antenna due to subsequent building work or the subsequent laying of cables with high alternating fields in the close vicinity of the antenna cable)
* Electronic devices with an interference effect on the GPS signal have been put into operation in the vicinity of the GPS antenna equipment or receiver (e.g. pager transmitter)

Further information on the subject of the GPS antenna equipment can be found in the document titled "GPS Antenna Equipment".

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

4.1.3 Incorrect Time Output

Description – Local Time

- **Local time** transmitted is at variance with the actual local time

Cause / Solution

- UTC/Local time offset not set or set incorrectly
- DST changeover points of time not set or set incorrectly
- Time was set manually, system running in quartz mode
- Time has drifted as the system has been running in quartz mode for a lengthy period

Description - UTC Time

- **UTC time** transmitted is at variance with the actual UTC time

Cause / Solution

- Time has drifted as the system has been running in quartz mode for a lengthy period
- Time was set manually, system running in quartz mode
  Cause of incorrect UTC time when setting manually: incorrect local time entered (the local time must always be entered when setting)
  or the system was configured incorrectly (time zone offset, daylight saving time changeover)

4.1.4 No DST changeover

Description

- "daylight saving time" (summer time) does not appear on the tab time and date of the ***hmc*** software.
- The "daylight saving time" (summer time) is not set under status in the output protocol.

Cause / Solution

- Changeover points of time not set or set incorrectly
- Output/display was configured for UTC and not local time

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

4.2 Support from the *hopf* Company

Should the system show error indications other than those listed in ***Chapter 4.1 Fault Scenarios***, please contact the support team at ***hopf*** Elektronik GmbH with the exact description of the fault and the following information:

- Serial number of the device
- Screenshot of the Module Info - tab and TIME - tab of the ***hmc*** software (if possible)
- Occurrence of the error: during commissioning or during operation
- Exact error description
- In the case of GPS reception/synchronization problems ⇨ description of the antenna equipment used:
    - Components used (antenna, indirect lightning protector, etc.)
    - Cable type used
    - Total length of the antenna equipment
    - Sequence of components and cable lengths between the components
    - Antenna installation position (e.g. signal shading by building)

Please write to the following E-mail address with the above information:

support@hopf.com

Providing a detailed description of the error and the information listed above avoids the need for additional clarification and leads to faster processing by our support team.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

5 Maintenance / Care

The module is generally maintenance-free. The following points should be noted if it is necessary to clean the module/device.

The following **must not** be used to clean the receiver board:

- Fluids
- Cleaning agents containing solvents
- Cleaning agents containing acids
- Abrasive media

Do not use a wet cloth to clean the respective system.
There is the danger of an electric shock.

To clean the system use a cloth that is:

- Antistatic
- Soft
- Non-fabric
- Damp

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

6 Technical Data

General Data – Module only	
Operation:	Via ***hmc*** software
Protection Class:	IP00
Voltage Supply:	5V DC ± 5% (device internal)
Power Consumption:	Typical approx. 120mA (max. 150mA)
Maintenance-free buffering of the internal back-up clock:	more then 3 days
Weight:	approx. 0.2kg

Environmental Conditions		
Temperature range:	Operation:	0°C to +55°C
	Storage:	-20°C to +75°C
Humidity:		max. 95%, not condensed

Accuracy	
Internal PPS pulse on GPS reception (after 5min. continuous GPS reception):	Standard Quartz: < ± 30ns VCTCXO: < ± 15ns
VCO control of the internal quartz base (after 5 min continuous GPS reception):	Standard Quartz: < ± 0.030ppm VCTCXO: < ± 0.015ppm
Freewheel accuracy:	Standard Quartz: < ± 0.1ppm after at least 5min. GPS reception/ T = +20° C Drift for T = +20° C (constant): - after 1h: 0.36msec. - after 24h: 8.64msec. VCTCXO: < ±0.02ppm after at least 5min. GPS reception/ T = +20° C Drift for T = +20° C (constant): - after 1h: 0.72msec. - after 24h: 1.73msec.
Internal back-up clock (RTC):	± 25ppm / for T = +10° C to +50° C (constant)

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Module - Signal Outputs	
Full-duplex serial remote interface (without handshake):	Via 9-pole SUB-D (male) connector in the front panel (in RS232 level)
Status Optical Coupler:	Via 3-pole stackable screw terminal Resistive circuit-breaking capacity: max. 50mA / 80V DC

GPS Data	
Receiver type:	22 channel phase tracking receiver, C/A code
Evaluation:	L1 frequency (1575.42MHz)
Sensitivity:	Tracking: -161dBm Cold Start: -148dBm
Synchronization time TTF (Time to First Fix):	• Warm start: < 1 Minuten • Cold start: < 5 Minuten • First initialization < 12,5 Minuten (without valid leap second infomation)
Antenna connection:	• Via BNC socket • For active antennas, U_b = 5V DC / max. 70mA • Antenna power fed via BNC socket of the module

Special production:

Modifications can be made to hardware and software in accordance with customer specifications.

hopf Elektronik GmbH reserves the right to modify hardware and software at any time.

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

7 Factory default

1. **Deletion of the current leap second information**

2. **Time settings**

   - Difference time = **Not initially set by the user**
   - Changeover points of time: = **Not initially set by the user**
   - SyncON / SyncOFF timeout = **0000** / **0055** (minutes)

3. **GPS settings**

   - Reception mode = **Stationary-Mode (Position-fix)**

4. **Status optical coupler**

   - Synchronization status OK = **SYNC**

5. **PPS - 01**

   - PPS duration = **10 msec**
   - Minimum sysnchronisation status for a signal output = **QUSE**
   - Value for a TimeOFF Timer = **0**
   - Outpu invertetd = **deactivated**
   - Special Configuration = **All deactivated**

6. **DCF77 - 01**

   - Time basis = **Local**
   - Signal output for fault = **2Hz pulse**
   - Minimum sysnchronisation status for a signal output = **QUSE**
   - Value for a TimeOFF Timer = **0**
   - Outpu invertetd = **deactivated**
   - Special Configuration = **All deactivated**

7. **IRIG-B - 01**

   - IRIG-B - Format = **B007/B127 (Time / Year / Second of day)**
   - Time basis = **Local**
   - Minimum sysnchronisation status for a signal output = **QUSE**
   - Value for a TimeOFF Timer = **0**
   - Outpu invertetd = **deactivated**
   - Special Configuration = **All deactivated**

8. **Cyclic Pulse - 01**

   - Interval for cyclic pulse = **1 second**
   - Pulse duration = **50 msec**
   - Time basis = **Local**
   - Minimum sysnchronisation status for a signal output = **QUSE**
   - Value for a TimeOFF Timer = **0**
   - Outpu invertetd = **deactivated**
   - Special Configuration = **All deactivated**

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

1. Serial Interface- 01

- Serial Interface Parameter = **9600 / 8 / n /1**
- String Output = ***hopf*** **binär String**
- Time Base = **UTC**
- Output Scheme = **Without second forerun / immediate Control character**
- Sendezeitpunkkt = **Every Second**
- Spezielle Einstellungen = **All deactivated**

2. Parameter Setting - 01

- Param A = **All deactivated**
- Param B = **All deactivated**
- Param C = **All deactivated**
- Param D = **All deactivated**

After the module has been reset to the DEFAULT values, the GPS receiver requires after the initial setting of the difference time and the daylight saving changeover times up to 13 minutes of continuous satellite reception to determine the correct leap second information from the GPS data. The Module 8024GPS can only synchronize after this has been done.

The following message appears on the error display during this period:

GPS-Receiver in raw data mode – no synchronization

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

8 Appendix

8.1 GPS (Global Positioning System)

Satellites circumnavigate the earth about twice per day at an altitude of approximately 20,000 km, on 6 different courses and at different angles.

The GPS system was developed based on 18 satellites with 3 replacement satellites. In order to prevent short-term gaps in coverage the number was increased during development to 21 satellites with 3 replacement satellites. Above any point on the skyline, therefore, there are always between 6 and 11 satellites visible. Highly precise atomic clocks are on board every satellite (accuracy min. $1*10^{-12}$).

A base frequency of 10.23 MHz is taken from the atomic clocks. The two carrier frequencies used, L1 and L2, are produced from this base frequency.

- Transmission frequency L1 = 154 * Base frequency = 1575.42 MHz
- Transmission frequency L2 = 120 * Base frequency = 1227.60 MHz

Each satellite sends all important navigation and system data by modulation on these two carrier frequencies. In the public domain, data transmitted on L1 frequency may be evaluated. The precise time can be calculated from this data by defining the position via the antenna.

The GPS antenna receives the signals of all satellites that are within sighting range above the skyline and forwards them to the GPS receiver via a coaxial cable. 4 satellites are required for continuous time evaluation.

Time calculation

The GPS receiver calculates world time UTC (Universal Coordinated Time) from GPS world time (GPS-UTC) radiated by the satellite, by subtracting the leap seconds; at present (status: March 2014) world time is running 16 seconds behind GPS-UTC time. The difference is not constant and changes with the insertion of leap seconds.

The current standard time for the respective time zone is calculated by the addition of a time offset to the UTC time. The time offset is the time difference between UTC time and the time zone in which the clock system is situated, is set in the clock system by the user during commissioning of the clock.

Any DST changeover that is due in the time zone is carried out via a switching function that is to be configured in the clock system.

Advantages/Disadvantages GPS:

+ High accuracy
+ High security against interference
+ Worldwide application possible
+ High security against failure (terrestrial transmitters are often switched off when bad weather conditions prevail at the transmission location)
+ High independent clock accuracy
− Outdoor antenna required
− Limited antenna cable lengths

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com